

№	Field name	Detailed content, comments
1.	Name of the faculty	Information Radio Technologies and Technical Information Security
2.	The level of higher education	Master's
3.	Code and title of specialty	171 Electronics
4.	The type and title of the educational program	Multimedia systems, technologies and computer tools
5.	Code and title of the discipline	OK 2.5. Methods of decision making in information multimedia systems
6.	Number of ECTS credits	5
7.	The structure of the course (distribution by type and hours of training)	Lectures - 30, practical training - 20, consultations -12, independent work – 88, semester control - combined exam
8.	Schedule (terms) of study of the subject	Fifth year, semester - 9
9.	Prerequisites for learning the discipline	Higher mathematics, physics
10.	Abstract (content) of the discipline	MODULE 1. BASIC CONCEPTS OF THEORY OF DECISION MAKING. Theme 1. Introduction. Basic concepts of decision theory. Terms and definitions. Theme 2. Quality criteria in decision-making tasks in terms of risk. MODULE 2. METHODS OF OPTIMIZATION OF TARGET FUNCTIONS. Theme 1. Statement of the conditional optimization problem. Additive and multiplicative objective functions. Criteria and functional limitations. Theme 2. Methods for finding extrema with unconditional parametric optimization. Theme 3. Methods of random search. Theme 4. Methods for finding local extrema. Theme 5. Methods for finding global extrema.

		MODULE 3. EDITING INPUT DATA. Theme 1. Editing data with implausible values. Theme 2 Tukey-53-X procedure in problems of synthesis of optimal electronic systems. MODULE 4. GAME THEORY. Theme 1. Game models of decision making. Theme 2. Player strategy. The ultimate and endless game. Payment matrix. Principles of mathematical formalization of games on the examples of the simplest games. Theme 3. Solving games in mixed strategies. The basic theorem of game theory. Analytical and geometric solution of games.
11.	Competencies, knowledge, skills, understanding that a higher education acquirer has in the learning process	Be able to know. 1. Statement of the conditional optimization problem. Additive and multiplicative objective functions. Criteria and functional limitations. 2. Methods of finding local extrema. Zero order methods. Gauss-Seidel method. Rosenbrock method. Optimization of one-dimensional unimodal functions. 3. Completely random search. Managed random search. Implementation of algorithms in discrete mathematics. Terms of use and characteristics. Advantages and disadvantages of random search algorithms. 4. Class of gradient algorithms. The fastest descent method. Multi-step methods of the first order. Terms of use and characteristics. 5. Newton's method. Terms of use and characteristics. Advantages and disadvantages of second-order algorithms.

		6. Methods for finding global extrema of objective functions. 7. Filter method. Tukey-53X procedure. The concept of robustness. 8. Player strategy. The ultimate and endless game. Payment matrix. Principles of mathematical formalization of games on the examples of the simplest games. Be able to do. 1. Perform mathematical formulation of the optimization problem. 2. Make a choice of criteria according to the purpose of the problem to be solved. 3. Be able to build algorithms for finding the extrema of objective functions according to the methods of Gauss-Seidel, Rosenbrock, completely random search, controlled random search, the fastest descent, multi-step first-order methods, and Newton's method. 4. Be able to implement the filter method and the Tukey-53X procedure when editing input data. 5. Use the principles of mathematical formalization of games on the examples of the simplest games.
12.	Learning outcomes of a Higher Education applicant	1. To analyze the functional and circuit construction of the electronic system in terms of its optimization. 2. Perform the necessary calculations to determine the characteristics of devices and systems, evaluate the effectiveness of structural construction of the system. 3. Carry out computer modeling to determine the parameters of individual devices and the system as a whole.
13.	Assessment system in accordance with each task for taking tests/exams	As a form of final control for the discipline "Methods of decision making in information, multimedia systems" the combined exam is used. The final score is calculated by the formula: $O_{\text{д}}^{\text{екз}} = 0,6 \cdot O_{\text{сем}} + 0,4 \cdot O_{\text{екз}}$,

		where O_{cem} – assessment for the semester in a 100-point system, O_{ek3} – score for the exam in a 100-point system. The ticket for the exam consists of two questions of theoretical material and a task. Theoretical questions are evaluated in $30 \times 2 = 60$ points, and the task – in 40 points (at sum – 100 points). To evaluate the student's work during the semester, the final rating assessment O_{cem} calculated as the sum of grades for different types of classes and control measures. <table><tr><th>Type of lesson / control measure</th><th>Rating</th></tr><tr><td>Practical training № 1</td><td>$5 \times 1 = 5$</td></tr><tr><td>Practical training № 2,3,4,5</td><td>$10 \times 4 = 40$</td></tr><tr><td>Checkpoint 1</td><td>45</td></tr><tr><td>Practical training № 6,7,8,9</td><td>$10 \times 4 = 40$</td></tr><tr><td>Practical training №10</td><td>$15 \times 1 = 15$</td></tr><tr><td>Checkpoint 2</td><td>55</td></tr><tr><td>Total for the semester</td><td>100</td></tr></table>	Type of lesson / control measure	Rating	Practical training № 1	$5 \times 1 = 5$	Practical training № 2,3,4,5	$10 \times 4 = 40$	Checkpoint 1	45	Practical training № 6,7,8,9	$10 \times 4 = 40$	Practical training №10	$15 \times 1 = 15$	Checkpoint 2	55	Total for the semester	100
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14.	The quality of the educational process	The policy of academic integrity, updating the content of the discipline on the basis of modern practices, scientific achievements, recommendations of employers																
15.	Methodological support	Basic literature. 1. Polyak B.T. Introduction to Optimization — M.: Nauka, 1983. (in Russian) 2. Sytnik O.V., Kartashov V.M. Radio engineering systems — Kharkov.: SMIT, 2009. (in Ukraine)																

	3. Ilyin V.N., Frolkin V.T., Butko A.I. et al. Automation of circuit design — M.: Radio & Svyaz, 1987. (in Russian) 4. Batischev D.I. Methods of optimal design — M.: Radio & Svyaz, 1984. (in Russian) 5. Orlov A.I. Decision theory. Textbook.— M.: Publishing house "Mart", 2014. (in Russian) 6. Otnes P., Enokson L. Applied analysis of time series — M.: Mir, 1982. (in Russian). 7. Petrosyan L.A. Game theory. Textbook — M.: «Vyshaya schkola», 2014. (in Russian). Supporting literature. 1. Larichev O.I. Theory and methods of decision making — M.: Logos, 2000. (in Russian). 2. Vorobyev N.N. Fundamentals of game theory. Non-coalition games — M.: Fizmatlit, 1984. (in Russian). Methodical materials for independent work. 1. Summary of lectures on the subject "Methods of decision-making in information, multimedia systems" for students majoring in 171 "Electronics" educational training program "Systems, technologies and computer tools of multimedia" higher education master's degree. [Electronic edition] / author. O.V. Sytnik – Kharkov: XNURE, 2020. – 211 c. (in Ukraine).
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		2. Methodical instructions for independent work in the discipline "Methods of decision making in information, multimedia systems" for students majoring in 171 "Electronics" educational program training "Systems, technologies and computer tools of multimedia" level of higher education master. [Electronic edition] / author O.V. Sytnik – Kharkov: XNURE, 2020. – 21 с. (in Ukraine). 3. Exam questions in the discipline "Methods of decision making in information, multimedia systems" for students majoring in 171 "Electronics" educational training program "Systems, technologies and computer tools for multimedia" рівня вищої освіти магістр. [Electronic edition] / author O.V. Sytnik – Kharkov: XNURE, 2020. – 6 с. (in Ukraine). 4. Methodical instructions for practical work in the discipline "Methods of decision-making in information and measuring systems" for students majoring in 171 "Electronics" educational training program "Systems, technologies and computer tools of multimedia" higher education master's degree. [Electronic edition] / author O.V. Sytnik – Kharkov: XNURE, 2020. – 43 с. (in Ukraine)..
16.	The developer of the Syllabus	Professor, Doctor of Physical and Mathematical Sciences Oleg Viktorovich Sytnik oleh.sytnik@nure.ua